

Issue Backgrounder: West of the Divide— Fish & Wildlife Projects in Western Montana

Bonneville Power Administration
U.S. Department of Energy

Montana Department of Fish,
Wildlife and Parks

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Lake MacDonald,
Glacier National
Park.

Montana. The "land of the shining mountains." In the mountains of western Montana lies the birthplace of thousands of streams and lakes which in turn give life to countless species of fish and wildlife.

To the hunter, Montana means elk bedding down near a clear mountain stream. To a fisherman, Montana is the rippling surface of a reservoir and the strike of a trophy-sized bull trout. And no wonder. Rocky mountain bighorn sheep, the Great Basin Canada Goose, rainbow and cutthroat trout, and the kokanee salmon have thrived for ages in western Montana's pristine streams and highlands.

Yet these waters also yield power and productivity. Hydroelectric projects on Montana's rivers mean electricity for homes and businesses. Some of these same dams provide irrigation for crops and water for cattle. And because Montana's water resources are limited, conflicts have arisen over how it is best used. Especially in recent years, some of

the decisions have put fish and wildlife populations at risk.

In 1980, an act of Congress sought to preserve these important natural resources. The aim of the Pacific Northwest Electric Power Planning and Conservation Act (also called the Pacific Northwest Power Act) is to help protect fish and wildlife throughout the Columbia Basin—from the mouth of the Columbia to western Montana. It directed the Columbia River's hydroelectric developers and operators to consider the needs of fish and wildlife when making power decisions. The intent was to reduce damage already done to fish and wildlife and to protect existing populations from further harm.

The Pacific Northwest Power Act is a unique document. It pulls together all of the Columbia Basin's conflicting power and resource groups in a cooperative effort to save the region's fish and wildlife.

This landmark legislation also created a Northwest Power Planning Council (Council), consisting of two representatives from each Pacific Northwest state—Montana, Idaho, Washington, and Oregon. In 1982, the Council launched its Fish and Wildlife Program. The Program guides BPA and hydropower operators and regulators in their efforts to lessen hydropower impacts on fish and wildlife in the Columbia System.

BPA, the agency that markets the power produced at 30 Federal dams on the Columbia River, was authorized to fund a large portion of the Council's Fish and Wildlife Program. In the spirit of this cooperative effort, BPA works with the Montana Department of Fish, Wildlife and Parks (MDFWP) on nine separate projects aimed at protecting and enhancing western Montana's unique natural treasures. BPA funds two more fish and wildlife projects conducted by the Confederated Salish and Kootenai Tribes of the Flathead Indian Reservation as well as one other cooperative effort between MDFWP and the USDA Forest Service-Kootenai National Forest.



Mountains of the Swan Range south of Glacier National Park in northwest Montana.

of the line, the North American land mass slopes toward the Pacific Ocean.

Water from the 26,000 square miles of western Montana drains into the Columbia River which eventually pours 176 billion gallons of water into the Pacific each day. These lands contain more than 5,000 miles of streams and rivers and 1,000 lakes and reservoirs, including the Clark Fork, Kootenai and Flathead Rivers and Flathead Lake.

The mountains are rich in wildlife: geese, goats, mountain sheep, deer, and bear, both black and grizzly.

In August of 1808, when trapper and explorer David Thompson came face to face with the Swan Mountains, he wrote of "range after range of snow-capped mountains, higher than I had ever seen. These colossal crags soar like awesome temples carved by some ancient hand, standing in lonely relief against an incredibly blue sky." He added that the mountains "are rich in wildlife: geese, goats, mountain sheep, deer, and bear, both black and grizzly."

David Thompson, a lead man for the North West Company, was on his way over the Swans to set up Montana's first fur-trading post on the Kootenai River, near present-day Libby, Montana. His arrival marked a turning point. First in competition then in league with the Hudson Bay Company, the North West Company began "stripping the outer reaches of the Columbia drainage of fur-bearing animals." By 1860, furred creatures were so scarce that trappers were forced to sell deerhides for a living.

Biologists radiocollar
Flathead Valley
Canada Geese to
unlock the secrets
of their movements.



Some of BPA's Montana projects investigate the impact of hydroelectric dams on fish, with the aim of preventing any further damage to fish habitat. Other BPA projects seek to improve breeding conditions and feeding grounds for wildlife. In every case, the benefits to Montana's fish and wildlife will be balanced with flood control, power production, recreation and other uses of water—not only in northwest Montana, but downstream throughout the Columbia System.

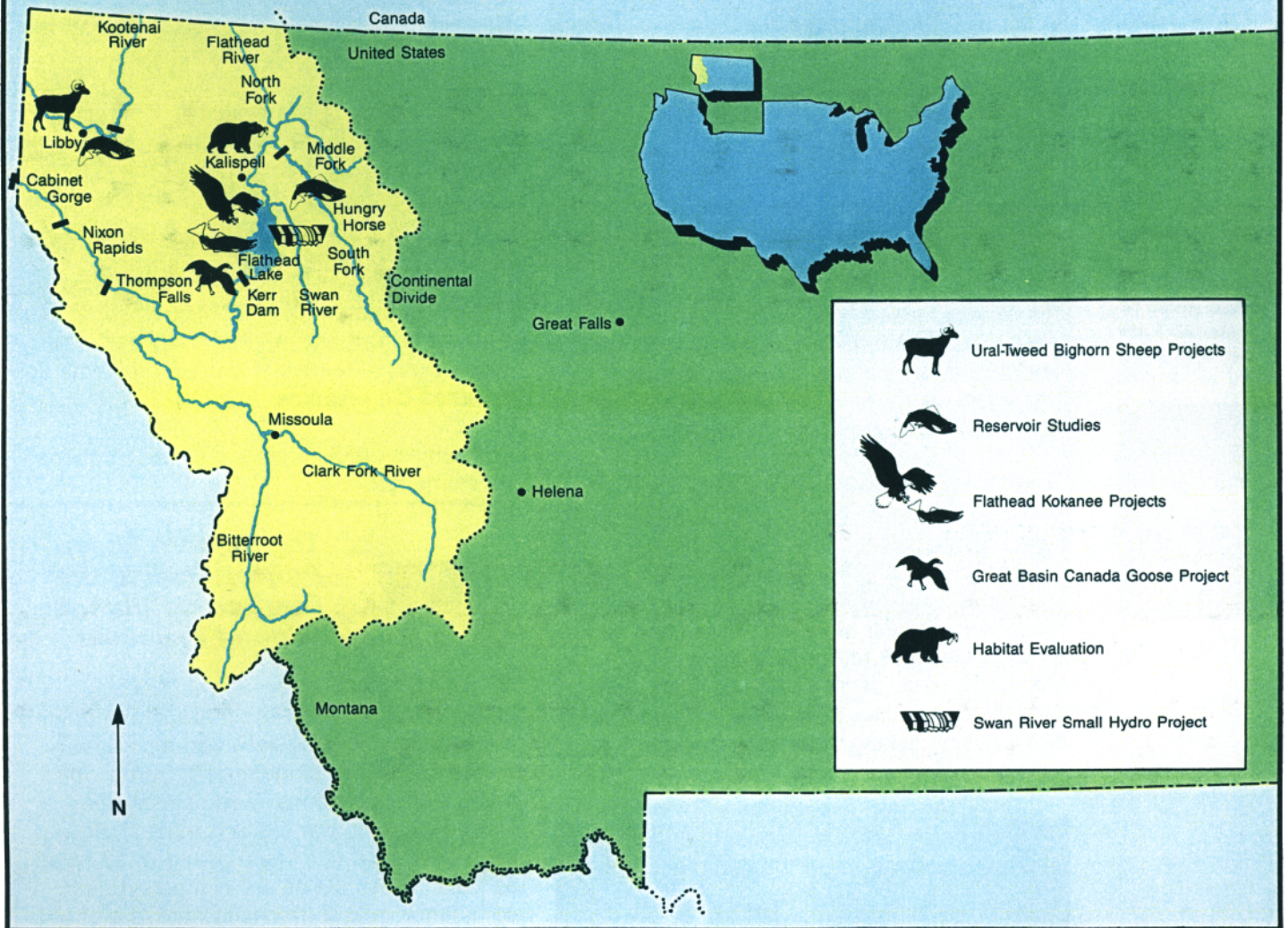
But understanding the current situation first requires a look at Montana's past.

Two Centuries of Progress Have Taken Their Toll

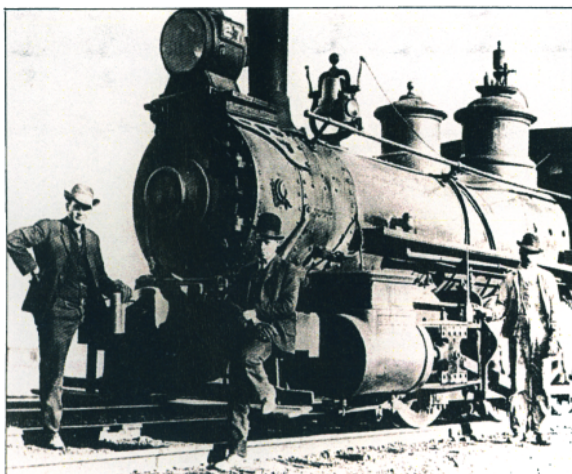
At the Canadian border, the Swan Mountains form the northernmost section of a line that splits Montana and divides the continent. West

BPA-MDFWP Fish And Wildlife Projects In Western Montana

BPA-MDFWP projects take place throughout the Columbia Basin area of northwest Montana, west of the Continental Divide.



The old Indian trails used by the trappers soon became roads bringing in succeeding waves of missionaries and miners. In the 1860s, these roads gave way to the Great Northern Railroad.



The 1870's saw construction of the Libby to Kalispell section of the Great Northern Railroad.

With the railroad came the first major influx of white settlers, lured by promotions that advertised the region's "mild climate, much like Paris or Venice." The new ranchers and farmers may not have found the promised temperate weather, but they did find a unique setting for their new life—a rugged natural beauty, wild and mountainous, dwarfing anything that could be found in much of Europe.

Progress came with the rapidly growing population. The settlers did much more than diminish an already depleted wildlife and fishery resource. They began changing the landscape—a practice that has continued to the present day. Their descendants constructed hydroelectric dams, diverting whole rivers to create new industries and new wealth. And all too often, modifying natural resources in the service of economic growth meant that nature came up the loser.

Hunters near
Helena, Montana;
circa 1890.



courtesy of Dan Hager

Yet despite these changes, fish and wildlife remain an important part of the lives of northwest Montana's people. The resource is renowned—not just in the state, but throughout the nation—for its quality and variety.

In 1983, resident and non-resident hunters spent an estimated \$140 million in Montana pursuing big game, upland birds and waterfowl. About one fifth of the state's estimated total of 2.1 million hunting trips were made in northwest Montana. Fishermen spent an estimated \$88 million in pursuit of Montana's trout, salmon and coolwater game fish. More than one third of the estimated total of 3.4 million fishing trips were made in northwest Montana.

Fishing near
Rattlesnake Creek
on the Clark Fork
River.



MDFWP

Dedication of
Hungry Horse Dam,
1952.



Bureau of Reclamation

Threats to these important resources from hydroelectric development, not just in Montana but throughout the region, were major reasons for the enactment of the 1980 Pacific Northwest Power Act and development of the Council's Fish and Wildlife Program.

Important parts of the Council's Fish and Wildlife Program are based on recommendations from MDFWP, the U.S. Fish and Wildlife Service and the Salish/Kootenai tribes. They aimed to produce a broad-based effort touching all of western Montana's fish and wildlife needs. Even before the Program, MDFWP managers had identified hydropower impacts on fish and wildlife. They had clearly defined steps needed to correct problems and enhance the resource.

The projects BPA funds are based on those recommendations.



The Bighorn Sheep Project: Pulling the Ural-Tweeds from the Edge of Extinction

On the northwest slopes of the Salish Mountains, just south of the Canadian border, the serenity of a cloudless autumn day is broken by the echoing crash of horns. On a rocky bluff high above Tweed Creek near Libby Reservoir, two bighorn rams charge each other at a combined speed of 50 miles an hour. These males are competing for dominance over a dwindling race of bighorn sheep—the Ural-Tweeds.



Fish and Wildlife Service

Horn butting bouts establishes the order of dominance between bighorn rams.

This small herd is the last remnant of northwest Montana's native population of bighorns. Ural-Tweeds once ranged from the Canadian Rockies down to Cripple Horse Creek northeast of Libby. Now they are confined to a few square miles along the rim of Libby Dam's Lake Koocanusa.

In the past 20 years their number has dwindled from nearly 200 to as low as 25. Montana wildlife biologists fear that the herd may be totally lost. Many factors may be responsible for the disastrous decline. But the loss of quality habitat is clearly the reason its numbers remain low. Biologists report that the limited and inferior food supply on the bighorns' winter range is the biggest threat to their survival.

Oldtimers in northwest Montana recall that wild sheep once spent their winters grazing the fields and river terraces along the Kootenai River between Fivemile and Sutton Creeks. That land is now at the bottom of Libby Reservoir. Libby Dam flooded 13,800 acres of big game winter range, including 4,350 acres of crucial winter and spring sheep habitat.

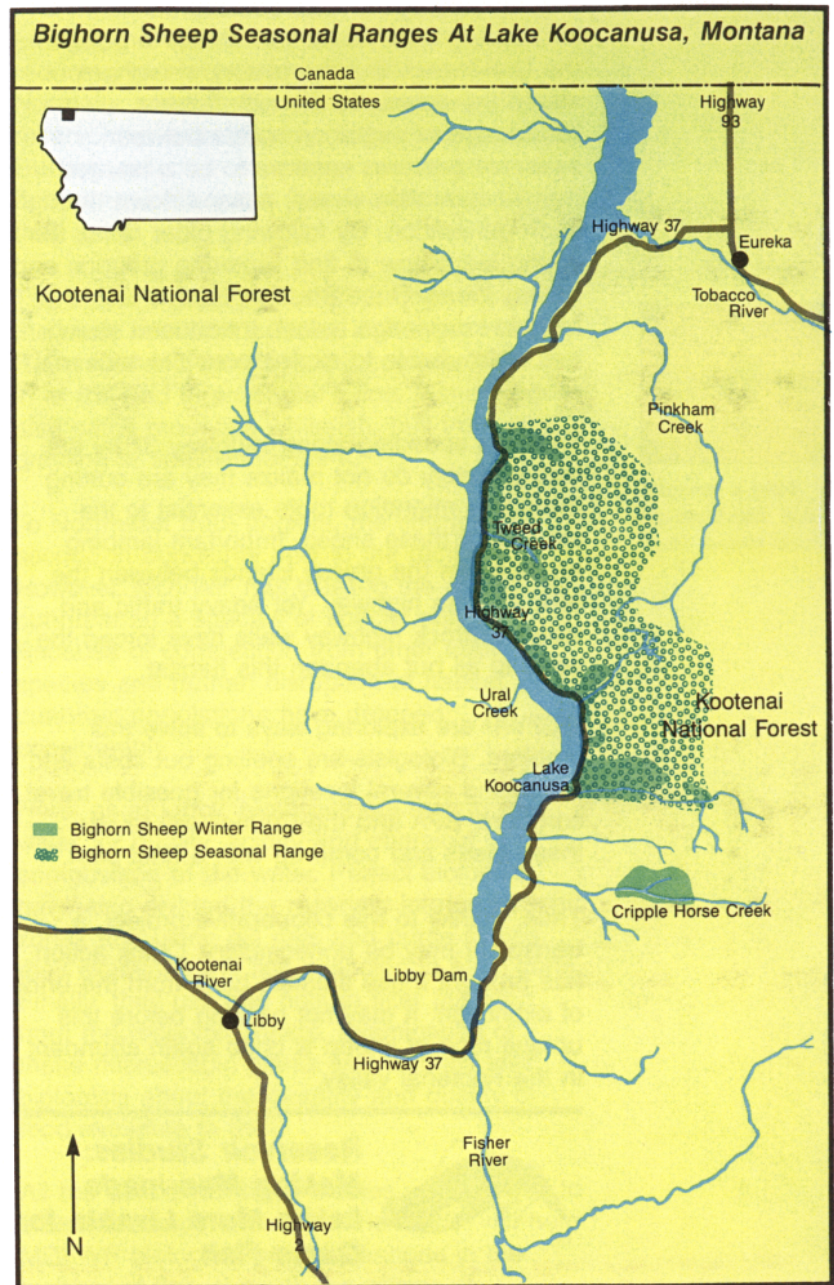
On the slopes above the highway, the remaining sheep habitat continues to deteriorate. For four decades, foresters suppressed fires. As a result, seedlings sprang up. A young forest replaced valuable grasslands.

Two BPA-funded projects are improving the habitat for sheep. Workers for MDFWP and the Kootenai National Forest have slashed, burned and reseeded the hillsides. By reworking the range, biologists hope to promote the growth of nutritious grasses and shrubs. In effect, they are resurrecting part of the herd's critical winter range.

Preliminary results are promising. By giving pregnant ewes better spring forage, biologists hope to see a rebound in Ural-Tweed numbers. MDFWP has radiocollared several animals in the herd so biologists can track sheep movements and map key habitat areas. By measuring sheep response to habitat improvements, they can outline a plan to maintain a viable Ural-Tweed population.



By improving the habitat, biologists can increase the number of lambs born and thus increase the bighorn sheep population.



Wildlife biologist Chris Yde with a 2-year old Ural-Tweed ewe, one of the 1984 herd's 25 members.

MDFWP biologists have considered introducing another race of sheep to bolster the Ural-Tweed. But the history of bighorn sheep transplants is rife with failures. Knowledge of migration routes between seasonal pastures appears to be a learned trait for mountain sheep, passed down through each generation. By following older rams, the young learn how to find wintering grounds and rutting areas. Once a native herd is lost, that historic knowledge is lost. Introduced sheep are often unable to exploit potential seasonal ranges.

Travelers speeding along Highway 37 by the lake probably do not realize they are cutting through a migration route essential to the survival of these sheep. Important lambing areas lie on the grassy islands between the lake and the highway. Yet heavy traffic and steep bedrock highway walls have forced the ewes to all but abandon this habitat.

MDFWP are exploring ways to solve this problem. Biologists are spelling out costs and evaluating several locations for possible travel corridors. BPA and the Council will review these ideas and come up with a final plan.

Thus, thanks to this cooperative project, a transplant may be unnecessary. Quick action has brought these animals back from the brink of extinction. It may not be long before this unique race of sheep is once again abundant in the Kootenai valley.

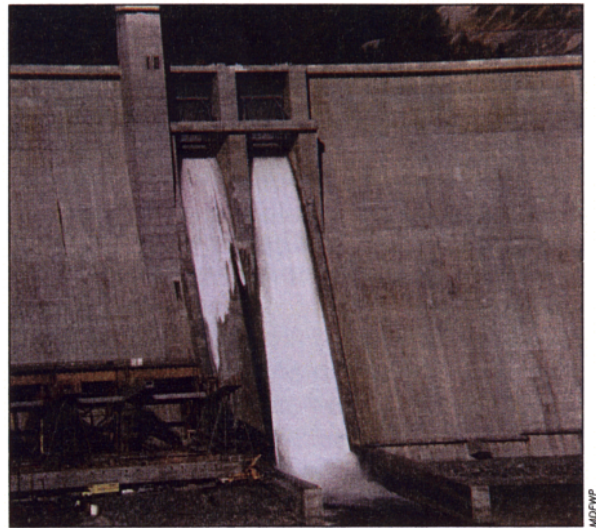


Reservoir Studies: Making Man-made Lakes More Livable for Game Fish

One thousand feet downslope from the sheep, cool autumn weather signals another change. The water level in the huge storage reservoir behind Libby Dam slowly begins to drop.

From hundreds of miles away in Portland, Oregon, power managers have sent the operators of Montana's two Federal dams their first water request of the season. Downstream on the Columbia River, giant turbines at 19 Federal dams need increased flows to meet winter power demands.

But meeting power demands can mean destroying a fish's major food source. Receding and fluctuating reservoir waters scour clean the lake's major food production area. The narrow strip where lakes meet the land is among the most fertile areas on earth. The majority of lake fish are born and nurtured here.



Spill from Libby Dam is required to meet winter power demands.

Each acre of this shallow fringe—simply called the “edge”—can produce up to 10 tons of organic food a year, compared to the four tons yielded annually by a fertile hayfield. At Lake Koocanusa, the annual 15 percent drop turns the reservoir's most critical biological zone into an ecological desert.



Fluctuating water levels can turn the biologically productive edge of a river or lake into a barren mudflat.

Aquatic insects that inhabit the bottom silts near the edge of the reservoirs are stranded high and dry. A critical link in the food chain is broken. In the short period of time that the water levels rise to cover the silts, the animals cannot reproduce quickly enough to rebuild the chain.

Hydroelectric impacts on this critical life zone are a major part of a reservoir study conducted by MDFWP and funded by BPA. The project will establish a link between dam operations and resident game fish populations.

Project biologists will measure how reservoir drawdown alters the physical and chemical qualities of the water. They will suggest ways to prevent the often stressful and dangerous conditions that hinder the ability of game fish to thrive and reproduce.



Microscopic plants and animals filtered from reservoir waters tell experts much about the quantity and quality of food available for fish.

Lake Koocanusa was created by the completion of Libby Dam in 1972. Some 90 miles long, the reservoir stretches across the northern U.S. border into southern British Columbia. Libby Dam is operated by the U.S. Army Corps of Engineers. Water levels can fluctuate up to 172 vertical feet annually. The average drawdown reduces the reservoir to one third of its maximum volume.

MDFWP biologists are investigating how reservoir operations can be modified to benefit fish and still serve all the other important uses downstream. These uses include not just power generation, but flood control as well. The water is also needed to maintain successful kokanee salmon spawning in Flathead Lake, and to help flush salmon smolts down the mainstem Columbia to the Pacific Ocean.

At Libby Reservoir, cutthroat, bull trout and mountain whitefish were once the most abundant species. But the situation has changed radically, through both human intervention and natural selection. Federal and state agencies tried to manage cutthroat as Libby's primary game fish, but rainbow trout have now taken over as the dominant species.

BPA's reservoir studies will determine what water levels are needed to maintain or increase the numbers of all the valued game fish at this popular angling spot.

A similar effort between BPA and the MDFWP concerns game fish on the Hungry Horse reservoir. Hungry Horse Dam, operated by the Bureau of Reclamation was finished in 1953. Its large storage reservoir extends 35 miles upstream along the South Fork of the Flathead River.

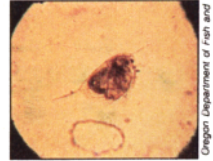
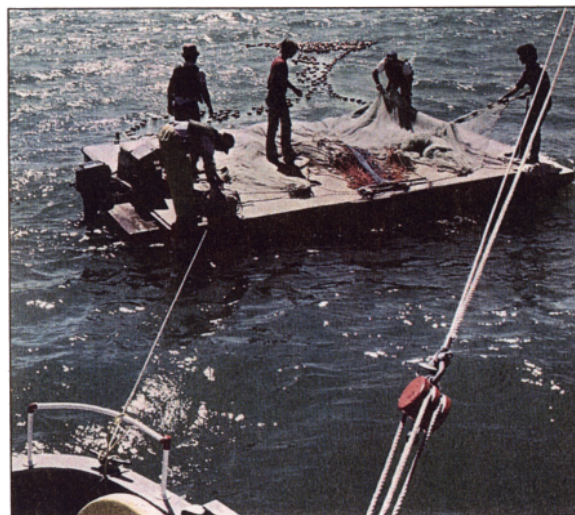
The maximum drawdown on record, in 1972, brought the water level down 128 feet, reducing reservoir volume by 63 percent. Normally, water level drops only about 75 feet; reservoir volume falls to a little more than half. But *any* reduction in volume means less habitat for both game fish and the organisms they eat.

The native westslope cutthroat trout is one of the most abundant species in Hungry Horse Reservoir, and the one most commonly hauled in at the end of an angler's line. Fishermen also catch mountain whitefish, bull trout, and grayling in smaller numbers.

To Northwest trout anglers, the cutthroat is second in popularity only to the rainbow. However, MDFWP has classed the westslope cutthroat as a species of special concern. Because of competition from other trout species and human disruption of habitat, cutthroat populations have dropped considerably.

Here, as at Libby, biologists are testing the water for quality, acidity and chemical composition of the water. Project biologists have also divided the reservoir into geographic zones and using gill nets and purse seines, they examined the fish collected in each zone. Finally, they use fine nets to filter plankton from the reservoir waters. Examination of these microscopic plants and animals tells biologists about the quantity and quality of food available to fish.

All the data from BPA's studies will be used to create a computer model. The model will help MDFWP biologists predict changes in the number of fish, through the effects of changing reservoir operations on the production of fish food organisms.



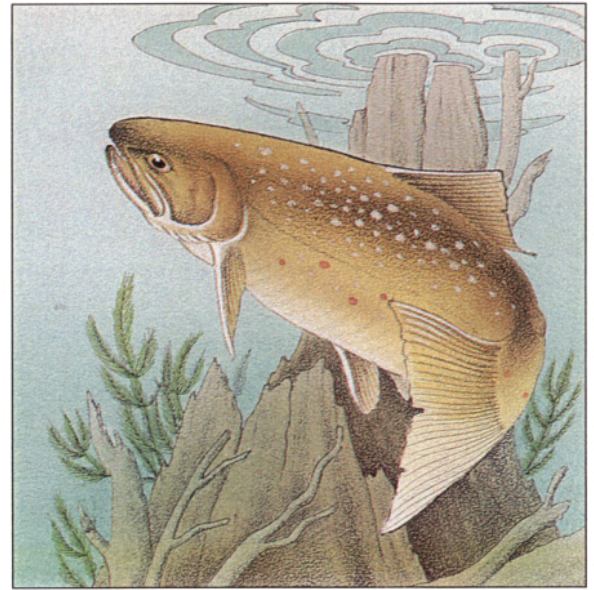
Daphnia, a small aquatic insect, is a trout's favorite food.

Biologists lay gill nets and purse seines at several strategic sampling stations throughout Hungry Horse Reservoir.



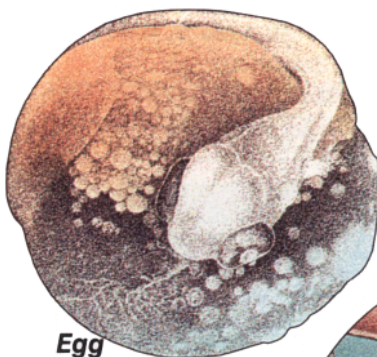
Rainbow Trout.

They are the best known and most widely distributed of the members of the trout family. The young remain in the gravel 2 weeks to a month, feeding on their yolk sac. Once the sac is absorbed, the young fish wriggle free of the gravel and move to the lakeshore where they hide among logs, tree roots and aquatic vegetation. Rainbows can grow as large as 24 inches. Like the cutthroat and kokanee, the rainbow has a sea-running form. In the case of the rainbow, this form is called the steelhead.



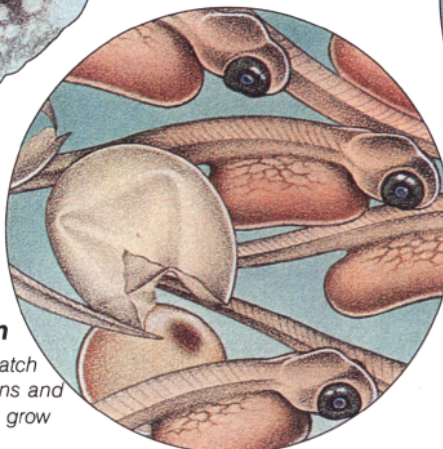
Bull Trout.

This large and voracious eater can grow to 36 inches and weigh as much as 32 pounds. Most adult fish, however, weigh between 5 and 15 pounds. Bull trout feed on a variety of items, including aquatic insects, amphibians and other fish. They spend about 2 years in the stream of their birth before migrating to lakes. When they mature, they return to the streams to spawn. The greenish-brown trout is covered with yellow spots which vary to red or deep-orange on its sides. It is sometimes called Dolly Varden, a name that recalls an era when women of fashion wore brightly colored hats.



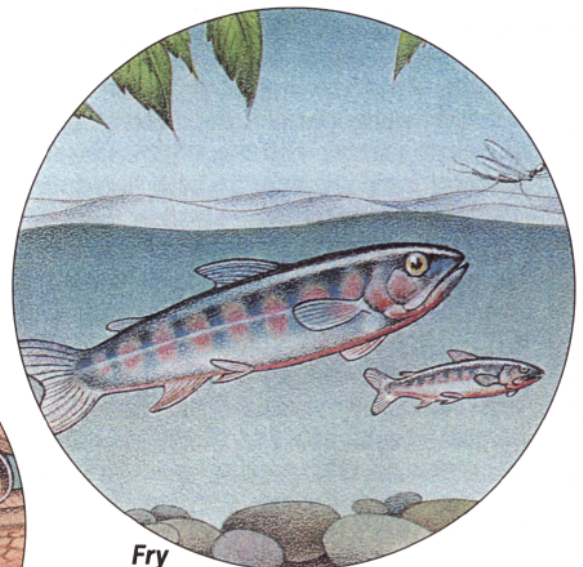
Egg

Fertilized eggs lie in gravel about 50 days.



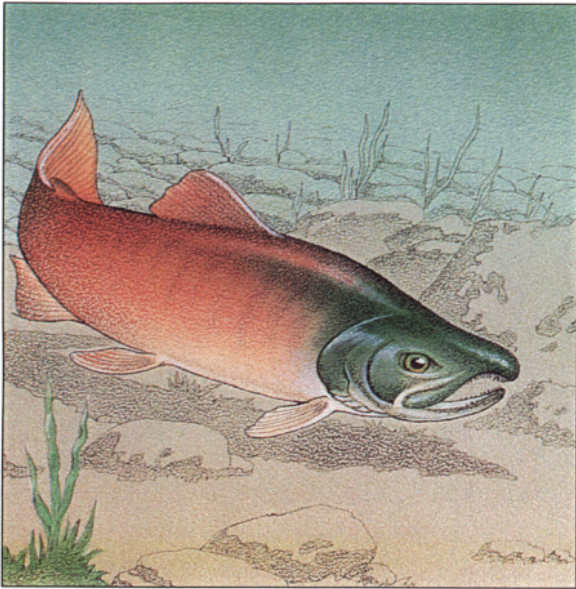
Alevin

Eggs hatch in alevins and quickly grow into fry.



Fry

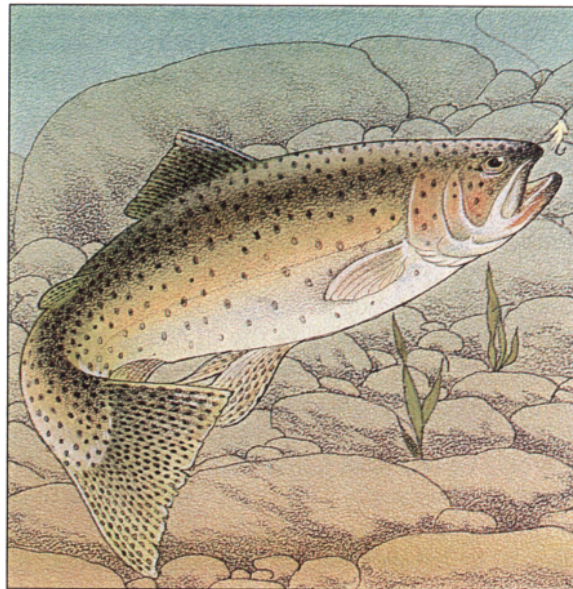
Fry emerge in spring and descend to lake. Fry spend four growing seasons in lake. Adults ascend river and spawn.



Kokanee.

The kokanee, or little redfish, is a landlocked sockeye salmon. Their life cycle is similar to that of their seagoing brothers. But life in freshwater dwarfs the kokanee. They are rarely more than 18 inches and are one-third the weight of a sea-running sockeye. The fish has a greenish-blue back with silvery sides and belly. Spawners turn bright red. They spend their young lives feeding in lakes. Most reach maturity between their third and fifth year. Then, during the spring or early summer, they migrate to the lakeshore or into tributary streams to build redds and spawn. After spawning, adults die. Depending on water temperature, the eggs hatch in 6 to 9 weeks.

Fry remain in the gravel another 2 to 3 weeks. After leaving the gravel, the young immediately return to the lake. Kokanee fry can only survive 48 hours outside of moving water.



Cutthroat Trout.

These once were the most common of coldwater game fish. Measuring from 10 to 18 inches in length and weighing up to three pounds, the cutthroat gets its name from two red slash marks under its lower jaw. The black-spotted cutthroat has prominent black spots along its sides. Juveniles spend one to three years in tributaries before migrating to the reservoir. They normally stay one to three years, then return to their natal stream to spawn during the summer. Other strains of westslope cutthroat spend their entire life cycles in small headwater streams or migrate to and from the mainstem Flathead River.

Spawning Cycles of Game Fish Species

BPA's fishery projects in northwest Montana study fish in Flathead Lake, several forks of the Flathead River and two reservoirs, Hungry Horse and Libby. The studies focus mainly on one group of fish, *salmonids*. This family includes some of the most numerous and popular game fish in the Pacific Northwest, such as the salmon (kokanee), and trout. Their life cycles—variations on the same theme—are carefully intertwined with innumerable elements in their environment.

Salmonids prefer clear, cold lakes and streams. They do not tolerate extreme

temperature changes and cannot survive long in water above 80 degrees. Spawning usually occurs in small tributary streams or springs.

The nests, or redds are circular depressions dug in fine gravel in the stream or lake bottom. Once fertilized by the male, the eggs will hatch in one to six months, depending on stream water temperatures. Adult trout then move back to the lake and return to the streams to spawn several more times. Adult salmon, by contrast, spawn once and die.



Kokanee Projects on Flathead Lake: Rebuilding the Runs after a Steep Decline

The Flathead River stretches 32 miles downstream from the Hungry Horse spillway. It empties into the north edge of Flathead Lake—the largest natural freshwater lake in the West—covering some 127,000 acres. Every fall, anxious anglers line the banks of the river, hoping to snag their share of bright red spawners. Fishermen catch almost 450,000 kokanee a year; that makes up almost 90 percent of the total game fish harvest in the Flathead system.

Mature bald eagle, MacDonald Creek, Glacier National Park.



Mike Ager/NOAA

But all is not well for the kokanee population of Flathead Lake. The number of fish spawning by the lake shoreline and in the mainstem Flathead River has been declining rapidly since the late 1970s.

The Kokanee-Eagle Connection

As a chill fall breeze cools the air over McDonald Creek, just above the Middle Fork of the Flathead River in Glacier National Park, majestic birds begin to glide in from the north. Soon they are diving, claws outstretched, to the surface of a creek rippling with spent and dying redbacked fish.

The bald eagle, America's national symbol, has arrived once again to feed on the kokanee as they make the annual run from Flathead Lake to their spawning grounds. The eagles, too, are on their yearly migration, to winter nesting sites in the South—in Utah, Nevada, California and Colorado. They number in the hundreds, both mature birds and young ones making their first long trip.

As many as 65,000 visitors come each year to watch the aerobatic display from the creek bridge at Apgar. The eagles' catch is easy and plentiful. In 1984, for example, about 600 migrating eagles converged on a two-mile stretch of lower McDonald Creek, choked with almost 90,000 spawning kokanee.

Numbers of eagles and numbers of fish are directly linked. By knowing the number of kokanee in the stream, biologists can almost predict the number of eagles that will show up.



Comparison of Kokanee and Eagle Abundance in McDonald Creek, Montana

	1979	1980	1981	1982	1983	1984
Kokanee	56,000	50,000	104,000	31,000	34,000	86,500
Eagles	516	377	639	306	251	571

Alley McChesney

The mainstem Flathead River run, which once supplied more than half the lake's kokanee population, now accounts for only 16 percent. A mere 3 percent now come from lakeshore spawning, with similar small percentages from the Flathead's South and Middle Forks, and from the Whitefish River. Now more than 70 percent of the lake's fish are from the McDonald Creek run in Glacier National Park.

Biologists believe the decline was caused largely by the operation of two dams: Hungry Horse Dam, upstream of Flathead Lake on the mainstem Flathead River, and Montana Power's Kerr Dam, below the lake's southern outlet. A BPA-funded study is now investigating the effects of dam operations on kokanee reproduction in the Flathead system. The current effort carries on previous work by the Bureau and MDFWP.

Kokanee—a race of sockeye salmon—is not native to the Flathead system. It was first introduced in 1916 and quickly began to thrive in Flathead Lake. Over the next few decades, the population boomed.

But in the mid-1970s, the trend reversed. Hungry Horse Dam operations shifted; operators started releasing water in the fall, during the kokanee spawning period.

Kokanee in the mainstem Flathead dig their nests, or redds, in shallow shoreline areas. When the reservoir drawdown ended, most fish nests were left completely exposed. During the critical winter incubation period, entire spawning beds froze. Spawning success plunged along the river banks. The river spawning run declined sharply.

The one that didn't get away. Angling for kokanee on the Flathead River is a popular autumn activity.



MDFWP

In Flathead Lake, a similar situation greatly reduced the number of kokanee shoreline spawning areas. Kerr Dam draws down the top 10 feet of the lake during the spawning and incubation period. In an average year, biologists might find only 750 redds, as compared to the 30,000 to 100,000 in McDonald Creek.



Poorly timed reservoir drawdowns can leave kokanee redds high and dry.

The BPA project monitors the kokanee population and spawning activities throughout the year. Even in the dead of winter, MDFWP divers spend hours, snorkeling in the river or diving in the lake, recording information on underwater vegetation and habitat, fish species and numbers.



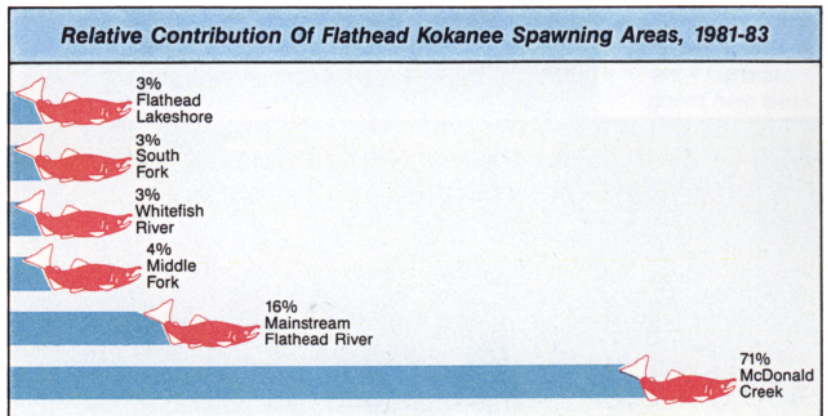
Biologists spend hours snorkeling to sample redds; their research provides the information necessary to sustain kokanee populations.

Surveyors examine fish nests along the shoreline. Samples from deeper redds have shown that eggs are killed by lack of oxygen. This may have been caused by decomposing organic material, by a jump in construction along the lakeshore, as well as by poor water flows.

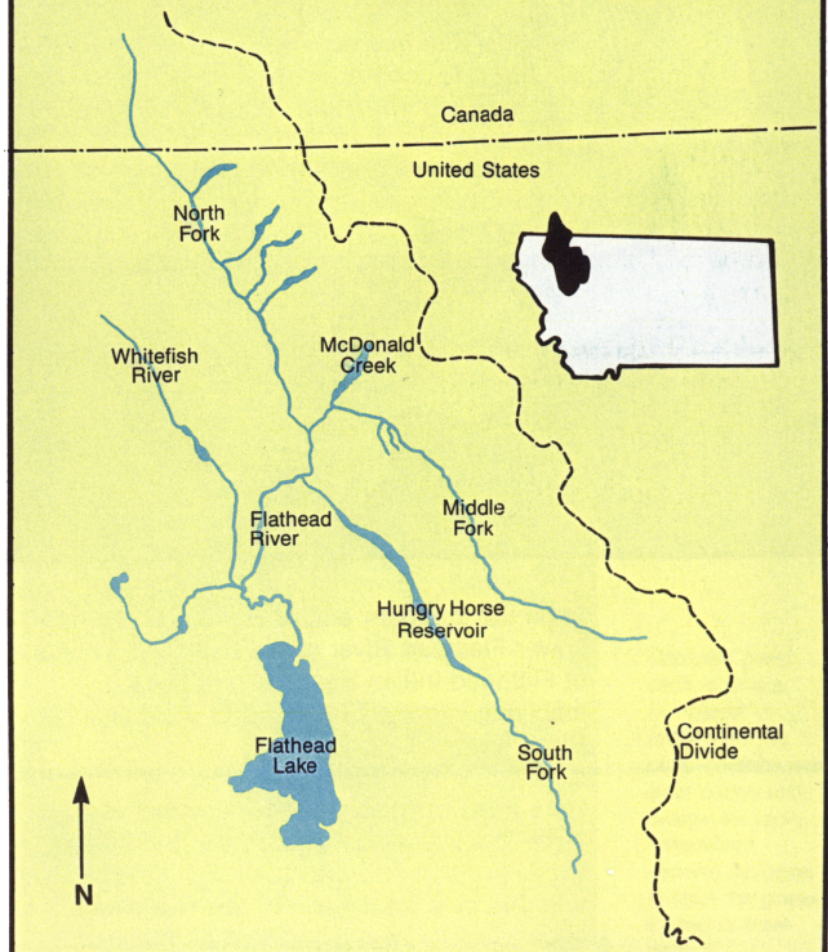
As a result of the BPA-MDFWP study, Federal agencies have taken several steps to protect the Flathead's kokanee. The Northwest Power Planning Council has recommended that BPA and the Bureau of Reclamation, which operates the dam, provide stable fall and winter flows from Hungry Horse Reservoir to

keep riverside spawning grounds wet. Flows are now held constant in the upper river during salmon spawning runs.

The state also reduced fishing limits from 35 per angler to 10. The snagging season was closed altogether in the fall of 1983 to speed recovery. Because the population had plunged so low, the recovery will take time. But biologists predict the mainstem Flathead River run could be back to full strength by the late 1990s, if not sooner.



Montana's Upper Flathead Drainage: Home to Montana's Kokanee Salmon



Tribal Fisheries Study: Protecting the Lower Flathead's Living Resource

Biologists for the Salish-Kootenai tribe have been studying fish on the south shore of Flathead Lake and in the Lower Flathead River since early 1983. But instead of finding fish, the tribe's divers have found a barren underwater terrain—much like the surface of the moon. Biologists suspect that fluctuating lake levels have scoured the lake's bays clean, not only of spawning gravel, but of the soil aquatic plants thrive in. Without vegetation, young fish have no place to hide from predators.

Because of the study's findings, the tribe immediately ordered catch and release fishing on the Lower Flathead.

But that is not enough; in order to protect and enhance the fish, biologists must pinpoint critical spawning areas and learn more about fish reproductive behavior. To do this, biologists electroshock the river's pools for trout and northern pike. In the streams leading to the river, several tons of carefully placed wire screens temporarily trap migrating fish. Shocking and trapping holds the fish long enough to identify, tag and measure them. Radio transmitters have also been planted in some pike. By trailing the fish for the life of the transmitter—about three years—the pike will reveal which factors, both manmade and natural, limit their population.



From the southern end of Flathead Lake, the Lower Flathead River winds through 55 miles of Flathead Indian Reservation before emptying into the Clark Fork of the Columbia River, west of Missoula.

Here tribal biologists—under contract with BPA—have found 27-pound pike and several two-to-five-pound brown trout. But in 1984, bull and cutthroat trout were so few that it was impossible to even estimate their numbers.



Fish traps on tributary streams holds migrating spawners long enough for biologists to identify, tag and measure them.

Data from the Salish-Kootenai study and the BPA-MDFWP Flathead fisheries project will allow managers to come up with alternative ways to provide needed hydroelectric power while lessening damage to fish.



Great Basin Canada Goose Projects: Easing the Pressure On the Elusive Big Birds

On the north shore of Flathead Lake, biologists snap bright red, solar-powered radio-tracking collars around the necks of wild Canada geese. The loose-fitting plastic collars, which do not bother the geese, weigh only three ounces.

Small panels of solar cells convert the sun's energy to electricity to power a tiny radio transmitter built into the collar. Each sends a continuous radio signal on its own frequency so the geese can be instantly identified.



Geese at dawn. Eagan Slough on the north end of Flathead Lake.

Using BPA funds, MDFWP biologists have collared nearly 20 wild adult geese. Members of the research team then locate nesting geese and track the movements of the secretive big birds and their goslings throughout the Flathead Valley.

BPA has a three-year contract with MDFWP to study Great Basin Canada Geese on the north shore of Flathead Lake and the upper Flathead River. The Salish-Kootenai tribes have carried out similar research on the south half of the lake and the lower Flathead River since February of 1983.

The construction of Hungry Horse and Kerr Dams has had a pronounced effect on water levels in the lake, as well as in the mainstem and lower Flathead Rivers. Reports over the past 30 years have shown that the loss of eggs and goslings is closely tied to low water levels. Receding water forms "bridges" between the mainland and the nesting islands, making goose nests easy prey. Power operations can also cause abnormally high flows early in the nesting season, flooding out up to 10 percent of the nests.

Loss of suitable habitat can limit goose populations in other ways. Mature geese may pair up but simply not nest. Wave action on the reservoir erodes islands in the lake and prevents the growth of aquatic vegetation. At times, mudflats two miles wide separate swimming geese from sheltering undergrowth.

Information from the solar-powered radiocollars and direct observation of radio-collared geese will help the biologists fully document the effects of fluctuating water levels on goslings. Using this data, they can come up with ideas on how to reduce the impact of hydro operations on goose populations.



Canada geese often take over osprey nests in the early spring before the raptors return.

Pat Mullan checks an osprey nest to see if Canada geese have been using it.



Biologists on the BPA projects seek to find out more about where geese go, how the young survive, what types of vegetation they prefer, and what their most suitable habitat is.

Great Basin Canada Geese currently number about 100,000 nationwide. A flock of 2,500 live on Flathead Lake and along the Flathead River. MDFWP biologists have counted nearly 100 breeding pairs in the northern Flathead Valley.



Captured geese each receive a numbered radiocollar. The collar contains two solar panels that charge the radio transmitters, allowing biologists to track the geese for two or more years.

The Flathead Valley is actually one of the major breeding areas for this race of Canada goose. Other flocks migrate from nesting sites in British Columbia to their winter feeding grounds in southern California, but many of the Flathead geese remain in the valley all year. They endure the subzero winter temperatures and frequent pockets of open water on the vast lake and on the Flathead River.

Every year, geese "home" to the same nesting grounds, often building on the same site they used the previous season. Usually they nest on islands in March or April. Their four to six eggs hatch in May, after a four-week incubation. The goslings then virtually disappear into the waterside underbrush.

Adults with their newly hatched fledglings are especially vulnerable. Often, the survival of the young—and of the species—depends on the quality of their habitat at this critical life stage.

Signals from the collars help biologists track subtle movements of the geese in and around thick streamside vegetation while the geese brood their goslings.



The brooding grounds for the Flathead Valley geese have historically been shallow shoreline areas, thick with cattails, alders and other vegetation. They need the protection of dense foliage to hide from predators—particularly during the molting season when loss of their tail and primary wing feathers makes it impossible for adults to fly. Brooding areas also provide plentiful food. The abundance of grasses, clovers, and nearby cultivated wheat allows the fledglings to eat continuously and grow.

But before they reach maturity, almost half will fall victim to predators. And humans have made it easier for the fox, coyote and the raccoon to prey on them. Flathead Lake, once a natural body of water, is now a reservoir. The lake is home to two thirds of the valley's goose population, yet only five percent of the area provides suitable nesting sites.

One solution is to build artificial tree nests, where young would be safe from drowning and predators. Geese often nest above ground—on

top of haystacks, in cliffs, even on hunters' blinds. They also use osprey nests early in the season before the fish hawks return to them.

Biologists are also looking at ways to manipulate goose habitat, by protecting existing brood sites and also seeding and planting new ones along the water's edge. The overriding objective for both of the BPA projects is to draw a balance between power production and goose production.



Habitat Evaluations: Measuring Wildlife Habitat Lost to Northwest Montana Dams

That same concept can be applied to furbearers and big game animals. BPA funded MDFWP to evaluate wildlife loss caused by hydro development at five major northwest Montana dams—Thompson Falls, Noxon Rapids, Cabinet Gorge, Hungry Horse and Libby. The study focused on the lives and habitat of important big game species such as deer, elk, and bear, as well as other species such as grouse and bald eagles.

MDFWP estimated the number of animals displaced and the amount of habitat lost when reservoirs filled. The state then developed plans to improve habitat around the reservoirs and protect other important wildlife areas. As a result, biologists hope to provide new winter range for mule deer, bighorn sheep and white-tailed deer. They aim to conserve crucial grizzly and black bear habitat. By protecting and improving wetlands, they can provide food and shelter for both Libby and Hungry Horse wildlife.



Swan River Small Hydro Project: Small Dams Could Accumulate Big Problems

In 1978, when the nation seemed to be facing impending energy shortages, Congress passed legislation to stimulate development of renewable energy resources.

The new law removed many legal barriers and provided new incentives for developing alternative energy sources. For example, the law required that public utilities offer to buy power from any small-scale generating resources producing 80 megawatts or less—such as small hydroelectric projects.

The effect on western Montana was quite dramatic. Developers rushed to stake their claims in what promised to be a profitable new "microhydro" industry. By 1982, entrepreneurs had proposed more than 100 small hydro projects for 88 different sites on local mountain streams—including 22 for the Swan Valley drainage area alone.

This prompted BPA to fund a study to learn exactly how several microhydro projects in a single drainage could affect the fish population. Biologists from the MDFWP and the U.S. Forest Service (Flathead National Forest) took on the job of assessing the possible cumulative effects, both biological and economic.

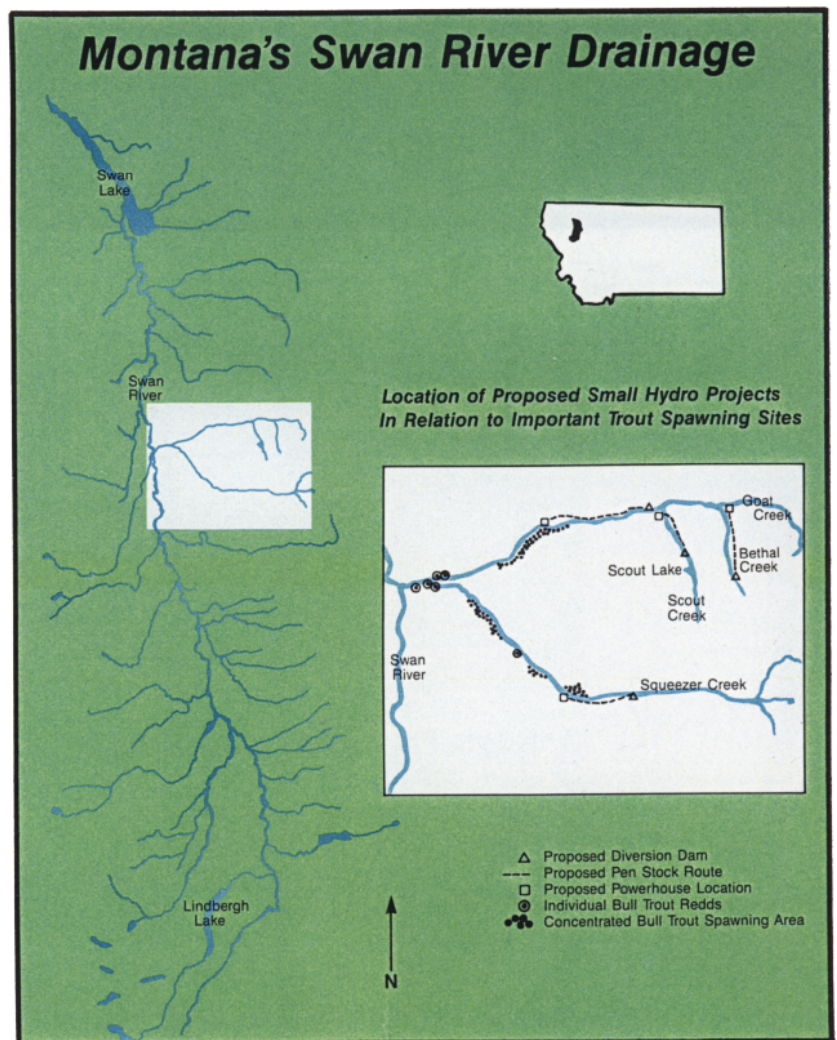
Taken individually, each dam may have little effect on the river environment. But what effect would dozens of small dams have on the river system as a whole? The loss of a few fish at each dam may seem acceptable to fishery biologists. But these losses could add up to the loss of an entire spawning run.

The Swan Valley, located to the east of Flathead Lake, includes the 2,680-acre Swan Lake and the 53-mile-long Swan River, as well as many dozens of streams and creeks where several trout species reside and spawn. The Swan River drains a total area of 671 square miles into the Flathead System. Sport fishing on the lake and river can be worth as much as \$800,000 a year.

Project biologists found the colorful brook trout to be the most abundant species in the tributaries, followed by cutthroat trout. In the Swan River itself, both brook and rainbow trout predominate.

But study results show that bull trout, the most significant migratory species in the Swan system, would be the fish hurt most by small hydro development. Up to 1,000 bull trout adults—sometimes measuring almost three feet and weighing 20 lbs—make the run every fall from Swan Lake to a few key spawning streams.

Construction associated with small hydro development, such as building roads and powerlines, would silt up streams and damage fish habitat. But biologists are more concerned with the "dewatering" of stream reaches by hydro diversions. The only time there would be enough water for both the fish and small hydro plants would be in the late spring and early summer. In some streams, up to 75 percent of the young trout could die. These impacts



Individually,
dam may
problem
biological

would be felt many miles downstream in the Swan River and Swan Lake fisheries.

By the end of the BPA study, all 22 hydro permits were withdrawn. The value of the study lives on in the substantial information it provided about the Swan drainage—especially about the four prime bull trout spawning areas for fishing.

Further,
model
microhydro

U.S. Bonneville Power
Administration

West of the Divide—
Fish & Wildlife
Projects in Western
Montana

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Issue backgrounder : west of
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Lower Flathead
Valley of Western
Montana.



Why This Program is Important to You

The Columbia River Basin Fish and Wildlife Program is a plan to accomplish a huge task: the rebuilding of natural populations of fish and wildlife damaged by hydropower development in the Columbia System. In fact, the Program is the largest concerted effort to protect fish and wildlife resources in the world.

Further, the Pacific Northwest Power Act is a unique document. It pulls together all of the Columbia Basin's conflicting power and resource groups in a cooperative effort to save the region's fish and wildlife. In the spirit of this effort, BPA has joined forces with MDFWP to complete a series of reasonable, balanced and coordinated projects aimed at protecting and enhancing these unique natural treasures.

The projects BPA funds through MDFWP, the Salish/Kootenai Tribe and Kootenai National Forest in western Montana will help biologists measure the impacts of hydropower development on resident game fish and wildlife in the northwest portion of the state. But these efforts are just a beginning.

From them will come recommendations and plans which can directly increase western Montana fish and wildlife populations. These projects will help balance the region's need for power production, flood control, recreation and irrigation with the region's economic and cultural demands for fish and wildlife.

These projects are part of BPA's broad-ranging program of fish and wildlife activities. The

program includes more than 150 projects taking place throughout the Pacific Northwest. These projects reduce damage caused by the development and operation of the Federal hydroelectric power system, as well as protect and increase key fish and wildlife populations.

For Further Information

If you would like more information on BPA's fish and wildlife effort or on the projects described here, contact your nearest BPA Area or District Office, the BPA Division of Fish and Wildlife, the BPA Public Involvement Office, or the Kalispell office of the Montana Department of Fish, Wildlife and Parks. In addition, BPA maintains a mailing list of people interested in keeping abreast of the agency's fish and wildlife activities. If you wish to be placed on that list, contact the BPA Fish and Wildlife Division at the number listed below.

BPA Area and District Offices

Portland (503) 230-4551
Eugene (503) 687-6953
Seattle (206) 422-4130
Spokane (509) 456-2515
Missoula (406) 329-3060
Wenatchee (509) 662-4377
Walla Walla (509) 522-6226
Idaho Falls (208) 523-2706
Boise (208) 334-9137

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